VARIATION OF ELEMENTAL COMPOSITION OF PARTICULATE MATTER BETWEEN AND WITHIN 20 STUDY AREAS IN EUROPE

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Background and Aims:
Recent research has indicated the importance of particulate matter (PM) composition on adverse health effects. Furthermore, knowledge of PM composition can be used to apportion pollution to its sources. In 20 study areas of the ESCAPE project, 2-week integrated PM sampling was conducted in 3 different seasons at 20 locations per area in 2008-2010. At the European level, these filters will reveal differences in elemental composition by city, season, size fraction, and site type; thereby, allowing potential determination of likely sources. Moreover, if elemental data can be spatially modelled, it can be linked with health data from cohort studies within ESCAPE.

Methods:
The filters from PM areas are being analyzed by x-ray fluorescence (XRF) to determine their elemental composition. Currently, a total of 1043 filters have been analyzed from the 1st year of sampling for 48 individual elements. As more analyses results are received and data are linked with filter information, trace element data will be examined by city, season, size fraction, and site type. We expect to observe groupings of correlated elements related to different sources; eg, traffic impacts reflected in Fe/Ba/Zn/Cu. Other aspects examined will include: mass contribution of elements to total PM; seasonal contributions of biomass burning (K) and road-salt use (NaCl).

Results:
An overview of all 950 analyzed sample filters, with an average mass of 535.5µg, shows an average elemental contribution of 14.2% of total mass. A correlation matrix of these filters already indicates several common groupings: Al/Si/Ca/Fe/Ti (crustal), Fe/Zn/Cu (traffic), Na/Cl (road/sea-salt). The strength of these correlations is currently buried by the aggregation of all filters.

Conclusions:
Examination of trace element composition of PM will reveal within and between area compositional differences over Europe, which may be associated with health effects. This is particularly notable as all the monitoring was done in a harmonized manner.

References:

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